

THE CERES S'COOL PROJECT

STUDENTS' CLOUD OBSERVATIONS ON-LINE

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**CERES Science Team Meeting
Hampton, VA
November 2005**

What is S'COOL?

- Education and Public Outreach arm of CERES
- *Backbone of Terra formal education effort*
- A simple way to involve K-12 students in real science
- A source of validation data for the CERES cloud data



Impact Measures

- 55 requests for S'COOL materials since May 2005

No Change

States "Top Five"

♣PA	20%
♣VA	10%
♣NH	7%
♣PR	7%
♣CA	5%

States "Bottom Five"

♣Virgin Islands	9
♣Vermont	7
♣Guam	6
♣Delaware	3
♣Northern Marianas	0

Small Changes

Web Visits "Top Five"

♣Finland
♣Mexico
♣Canada
♣France
♣UK

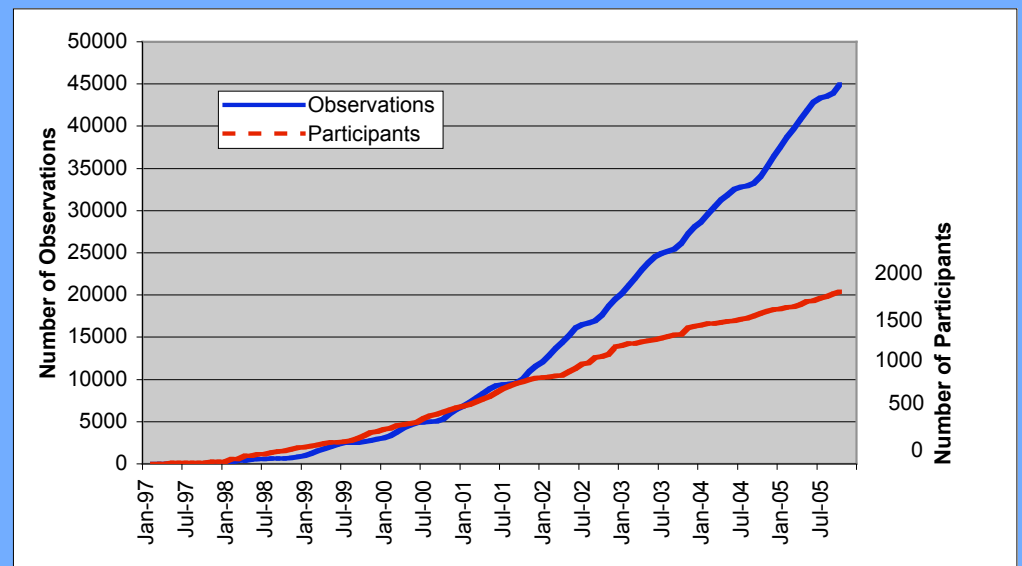
Observations "Top Five"

♣US	61%	↓
♣France	9%	
♣Colombia	6%	↑
♣Argentina	4%	↑
♣Croatia	3%	

Impact Measures (cont'd)

Database of observations - as of Oct. 2005

- > 45,000 observations
 - 46% have corresponding satellite data
 - 2689 from one site in Pennsylvania
- ~2,000 registered participants
 - 39% submitted data
- 66 countries
 - data from 48 countries(73%)







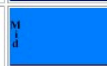
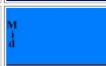


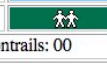

S'COOL Data

- A unique dataset matched to satellite
 - 15 minute temporal match
 - 1 degree spatial match
 - now working on closer spatial match (SSF)
- More than 21,000 correspondences available
- Most recent: Oct. 19, 2005 (from FLASHFlux)
- Data available via the Internet for analysis:

asd-www.larc.nasa.gov/SCOOOL/usedata.html

School Name	Latitude	Longitude	City	State	Country
Picture Rocks Intermediate	32.34	-111.18	Tucson	AZ	USA



Surface Information				Satellite Information 630201				
Date: 2005-10-19		Local Time: 11:15	Universal Time: 18:15	Date: 2005-10-19		Universal Time: 18:14:00		
Satellite: Terra				Satellite: Terra				
Opacity	Cloud Cover	Type	Visualization		Altitude	Opacity	Cloud Cover	Phase Temp (C)
								
								
								
								
Persistent Contrails: 00		Short-Lived Contrails: 00						
Surface Observations:	Snow/Ice: No Standing Water: No Muddy: No Dry Ground: Yes Leaves on Trees: Yes							
Temperature: 20.00 C Barometric Pressure: hPa Relative Humidity: 78.00 %								
Comments: No comments provided by participant.								

S'COOL Analysis - I

GROUND

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	Clr	L	M	LM	H	LH	MH	LMH	SUM
Clr	5.8	0.8	0.3	0.1	2.0	0.1	0.1	0.1	9.4
L	4.0	6.1	1.7	0.6	2.0	0.6	0.2	0.9	16.1
M	0.4	1.3	0.6	0.2	0.4	0.1	0.1	0.1	3.0
LM	2.4	15.2	4.4	1.9	3.2	1.4	0.5	2.5	31.6
H	0.1	0.4	0.1	0.0	0.0	0.0	0.0	0.1	0.8
LH	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.3
MH	0.4	3.9	1.7	0.6	0.8	0.2	0.2	0.6	8.3
LMH	1.7	10.8	3.6	1.7	5.9	2.7	1.0	3.0	30.5
SUM	14.8	38.6	12.5	5.2	14.4	5.1	2.2	7.3	100

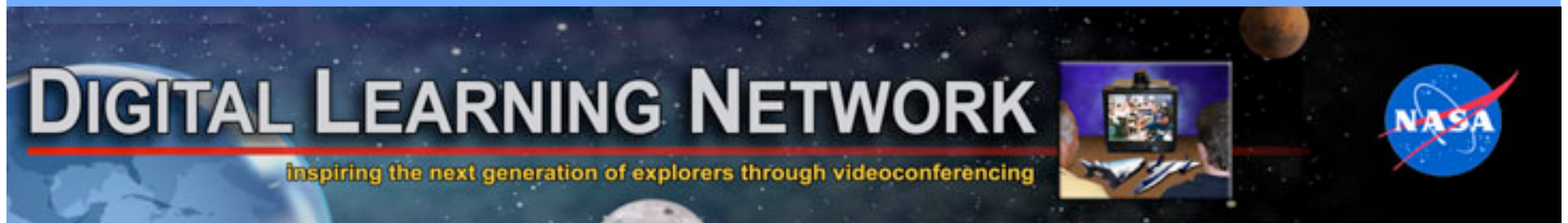
17.6% agree

S'COOL Analysis - II

- Issue with high clouds in gridded data
 - Looking at matching to SSF
- Studying mis-matches
- Accumulating lots of correspondences
 - Effect of snow
 - Surface reports of clear sky
 - Terra vs Aqua
 - FLASHFlux vs CERES processing
 - Sort by cloud height (spatial matching)
 - Satellite viewing conditions

S'COOL Presentations Since May 2005

- **2 National conferences** (AGU, NASA Living with a Star)
- **5 Presentations to student groups** (classroom visits, after-school groups, CHROME)
- **1 Videoconference using NASA Digital Learning Network** (connected to Middle School in NY)



S'COOL in the Field

- Teacher Ambassador presentations:
 - Oklahoma State Teachers Convention (C. Womack)
 - Oregon Space Grant Consortium (C. Clark)
 - Northeastern Regional NSTA (S. Sharack)
- Nicaragua: Received unsolicited feedback forms from every student at American Nicaraguan School



S'COOL Publicity

- **Last S'COOL Breeze Newsletter sent Sept. 2005**
 - English (1725)
 - French (53)
 - Spanish (245)
- **Earth Science Week 2005**
 - Listed as a supporter
 - Packets to active teachers

National Aeronautics and
Space Administration
www.nasa.gov



S'COOL BREEZE



Engaging students in authentic science to advance our knowledge of Earth through
Students' Cloud Observations On-Line

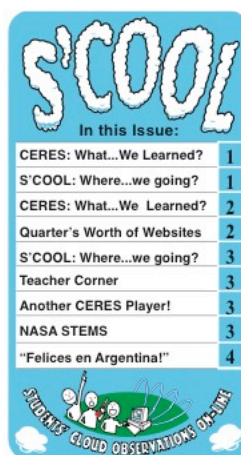
Volume 3, Issue 13

Explore. Discover. Understand.

September 2005

CERES: What Have We Learned?

by Lin H. Chambers, NASA Langley Research Center

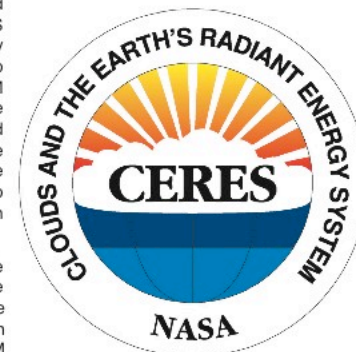


In early 2005, the Terra spacecraft celebrated 5 years of measurements. With the CERES instrument on the TRMM spacecraft, we actually have measurements going back 8 years, to January 1998. The CERES instrument on TRMM failed early, due to an electronic problem, but the CERES instruments on Terra have demonstrated exceptional calibration stability, with absolute calibration of 0.5, 1.0 and 1.0 % for the three channels. This level of stability is necessary to tease out the small signals we are looking for in the Earth's energy balance.

One of the major goals of CERES is to provide information that will help constrain and improve the global climate models that are used to predict future climate. The CERES data from TRMM provide an excellent test case in this regard, as the TRMM dataset from 1998 starts during a strong El Nino event in January and ends with normal conditions in August. Climate models have been challenged to reproduce the strong El Nino signals in tropical cloud and radiation energy fields.

Tying CERES data to the earlier record from ERBE, we now have a 20-year record of radiation budget. This has allowed identification of some decadal scale signals that are not yet understood. They appear to result from slow changes in the earth's cloudiness. Because CERES data are combined with cloud physical properties from the high spatial and spectral resolution MODIS instrument

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S'COOL: Where have we been? Where are we going?

by Lin H. Chambers, NASA Langley Research Center

In January 1997, we began a bold experiment: Could K-12 students provide useful information for ground truthing a NASA satellite instrument? From the very beginning, experiences with students indicated that the answer was "Yes". Since that time, S'COOL has collected more than 43,000 observations from around the world, with nearly 2000 participants now registered. CERES data have been processed in chunks, due to the rigorous analysis required for climate data. Thus, two major assessments have been made so far.



The S'COOL Team 2005: (from left) Dr. Lin Chambers, Dave Young, Tina Rogerson, Kay Costulis, Roberto Sepulveda, Joyce Fischer, Susan Moore and on each end are the S'COOL kids representing the students who have embraced this project.

An early assessment of the CERES data on TRMM provided limited but encouraging comparisons between ground and satellite data (http://asd-www.larc.nasa.gov/SCOO/BAMS_cover.html). A more recent comparison of more than 9000 ground-to-satellite correspondences was made in 2004 (<http://asd-www.larc.nasa.gov/SCOO/usedata.html>). Since then, many more CERES data have been processed, and the data are available (at the last URL) for you and your students to explore and explain.

Along the journey we added some additional

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S'COOL Awards

Sending new recognition certificate for various observation levels



Outlook for S'COOL

- **S'COOL received high marks during Terra Senior Review**
- **Currently working on integrated Terra Education and Public Outreach effort, of which S'COOL should be a key component**
- **May result in some changes: Students' CLIMATE Observations On-Line has been proposed**
- **Your comments and involvement are welcome**

S'COOL Needs YOU!

- **Participants in every state and 66 countries**
 - Offer to serve as a **resource to a local teacher**
 - Arrange a **S'COOL visit** when traveling
 - Provide **S'COOL info** to teachers you know
- **Presentation materials available**, with script suggestions
- **Help with translation of materials** (especially German and Italian)
- **Serve as resource for scientific content questions sent in by participants**